

**Statement of Edward M. Bolen  
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**Before the Subcommittee on Science, Technology and Space  
Committee on Commerce, Science and Transportation  
United States Senate**

**Hearing on the Commission on the Future of Aerospace Report  
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Mr. Chairman and members of the Subcommittee, my name is Edward M. Bolen and I am President of the General Aviation Manufacturers Association (GAMA). Thank you for the opportunity to testify today as representative of the general aviation industry and as one of the presidential appointees to the Commission of the Future of the U.S. Aerospace Industry.

Before I begin my testimony, I would like to take a moment to recognize the families and friends of the seven brave astronauts of the Columbia Space Shuttle who perished on February 1st. Our prayers and thoughts are with them. They are also with the fine men and women of NASA.

Over the course of the next several weeks and months, many questions will be asked about our nation's space program. The Commission on the Future of the U.S. Aerospace Industry felt strongly about this issue and devoted an entire chapter of its final report to the subject. In short, the Commission concluded that the United States must continue to be a space-faring nation in order to be a world leader in the 21<sup>st</sup> century.

But Mr. Chairman, my purpose today is not the nation's space program. I am here to talk about the first A in NASA—Aeronautics. My testimony will focus on the need for better coordination and increased support for NASA's aeronautics research and development programs, including those programs related to general aviation.

NASA's basic research is fundamental for significant breakthroughs in aeronautics. That is partially because NASA has many unique core competencies, but also because its

research is long term, very high risk, and not the kind of research that could be justified by a commercial enterprise.

NASA research is focused at the “pre-competitive” stage, well before commercial products are developed. In fact, experience has shown that a company may still need to invest hundreds of millions of dollars to bring to the marketplace a technology NASA has designated as ready for commercialization.

At the foundation of the Commission’s recommendations on aeronautics research is the belief that the United States needs a plan for its next generation air traffic management system. That plan, which we believe should be developed by both the aviation industry and all interested government agencies (including the Office of Management and Budget and the Departments of Transportation, Defense and Homeland Security), is necessary to help us value aeronautics research programs and determine how to best allocate scarce federal dollars.

In addition to having a plan, we need government coordination. Although interagency coordination currently takes place from time to time, it is fragmented and tactical, and often occurs at too low a level within the various agencies. This situation can lead to wasted, redundant or conflicting research programs—all things our nation cannot afford in the current environment.

## **THE ROLE OF GENERAL AVIATION IN THE AIR TRANSPORTATION SYSTEM**

With regard to general aviation and its role in our future air transportation system, I would like to point out that general aviation is defined as all aviation other than commercial and military aviation. It is the backbone of our air transportation system and is the primary training ground for the commercial airline industry. The U.S. general aviation fleet consists of over 214,000 aircraft that fly more than 29 million hours per year and carry more than 166 million passengers. According to a recent study by Global Insight, formerly known as DRI-WEFA, general aviation contributes more than \$41 billion to our nation’s GDP each year, creating over half a million jobs.

General aviation aircraft range from small, single-engine planes to mid-size turboprops to the larger turbofans capable of flying non-stop from New York to Tokyo. These planes are used for business purposes and recreation, as well as everything from emergency medical evacuations to border patrols and fire fighting. They are also used by individuals, companies, state governments, universities and other interests to quickly and efficiently reach the more than 5,000 small and rural communities in the United States that are not served by commercial airlines.

## **NASA RESEARCH IS CRITICAL TO GENERAL AVIATION’S ROLE IN THE NATION’S FUTURE AIR TRANSPORTATION SYSTEM**

For the past several years, NASA has been engaged in research that is of specific interest to general aviation. Specifically, I would like to highlight the benefits the general aviation community has realized from past NASA's research programs, as well as some of the technologies that are being developed as a result of NASA's current focus on general aviation.

The Advanced General Aviation Transport Experiment (AGATE) was a NASA cost sharing partnership with industry to recreate and speed-up the technological basis for revitalization of the U.S. general aviation industry. The goal of the program was to develop affordable new technology, as well as the industry standards and certification methods for airframe, cockpit and flight training systems for next generation, single pilot, 4-6 place, near all-weather light airplanes.

AGATE focused attention on moving technology that had been available only to commercial air carriers into general aviation aircraft. NASA and industry worked closely with FAA to bring electronic display regulations into line with current technology. As a result of this government-industry partnership, many new technologies were either brought to the market, or they were commercialized much sooner than would have been the case without AGATE. For a detailed discussion of how effectively this research was commercialized, I have attached a copy of the "AGATE Alliance Commercialization Impact Report". Perhaps the biggest lesson learned from AGATE was that NASA can be an effective research partner with industry.

Another success was NASA's General Aviation Propulsion (GAP) program aimed at developing revolutionary new propulsion systems for general aviation. Historically, it is new engines that have brought about the greatest changes in aircraft design and performance. At the entry level of general aviation, some very exciting new engines are on the verge of reaching the market.

NASA's GAP program is an excellent example of how NASA research brings technologies to the point where industry can later refine NASA breakthrough technologies and develop commercially-viable products.

## **SMALL AIRCRAFT TRANSPORTATION SYSTEM**

NASA's Small Aircraft Transportation System (SATS) initiative is a program to demonstrate how the integration of many next-generation technologies can improve air access to small communities. This program envisions travel between remote communities and urban areas by utilizing a new generation of single-pilot light aircraft for personal and business transportation between the nation's 5,400 public use general aviation airports.

Current NASA investments in aircraft technologies are enabling industry to bring affordable, safe, and easy-to-use technologies to the marketplace, including advanced

flight controls, innovative avionics, crashworthy composite airframes, more efficient IFR flight training, and revolutionary engines.

The SATS program is focusing on four key operating capabilities, which we fully support:

- Safe, high-volume operations at airports without control towers or terminal radar facilities;
- Lower adverse weather landing minimums at minimally-equipped landing facilities;
- Integration of advanced general aviation aircraft into a higher en route capacity air traffic control system, with complex flows that can safely and efficiently accommodate a wide range of aircraft with diverse performance characteristics;
- Improved single-pilot ability to function safely and competently in complex airspace in the evolving National Airspace System.

It should go without saying that NASA's technical expertise is an essential element of the SATS initiative. Only NASA can cut across traditional technical boundaries and integrate research benefiting general aviation vehicles, air traffic control procedures, airspace design and safety. And more than any other government agency, NASA has already demonstrated an ability to implement an effective consortium of government and industry that can produce results. This ability is due in large part to various collaborative research structures that are uniquely at NASA's disposal.

We believe that at the conclusion of the SATS program in FY05, many of these technologies will be mature enough to be handed-off to the FAA for final development and deployment, and we are working with the FAA to develop such a program. Technologies that result from the SATS program will greatly enhance the capacity of the National Airspace system.

But the SATS program does not meet all of general aviation's research needs.

## **ENVIRONMENTAL ADVANCEMENTS DUE TO NASA R&D**

NASA research on aircraft noise and emissions reduction technologies removes barriers to the growth of the aviation industry. The environmental impact of aviation operations is a significant constraint on aviation growth because many communities have a legitimate concern about aircraft noise and emissions. These concerns prevent the expansion of airport infrastructures which results in delays. In addition, aircraft noise results in tens of millions of federal dollars being spent each year to mitigate noise impacts by insulating and relocating individual homes. Noise mitigation, which only addresses noise at one specific airport, diverts funds which could be applied to safety initiatives or to enhance aviation system capacity.

The NASA Advanced Subsonic Technology (AST) Noise Reduction Program has resulted in technologies that are already being used on today's airplanes to lower noise at the source. This includes engine noise reduction from advanced inlet liners and exit nozzles and airplane noise reduction from advancements in aerodynamic wing design and reduced weight composite materials. The Quiet Aircraft Technology (QAT) Program will build upon the AST research into the next decade in support of NASA's goal to significantly reducing the environmental impact of aircraft noise on the community. In 2002, NASA and FAA initiated a new memorandum of agreement (MOA) to coordinate research activities and increase funding in support of the QAT program to speed up the introduction of lower noise aircraft technologies. GAMA strongly supports the coordination of FAA's Research Engineering & Development Program for Environment and Energy and NASA's noise and emissions research programs to remove barriers to the growth of the aviation industry and accelerate environmental benefits to the community.

## **SOFTWARE CERTIFICATION**

One new area where NASA's expertise would be especially useful is development of software tools that could be used by the FAA and avionics manufacturers to test avionics and other computer software used in the NAS to ascertain that it meets appropriate certification levels of reliability and integrity. NASA research in this area should be greatly accelerated and closely coordinated with the FAA, which is the organization that determines the minimum performance standards.

## **WEATHER SENSORS**

Another area where NASA research has great value is advanced weather sensors that can measure temperature and dew point from satellites at altitudes not typically traveled by airline aircraft. At lower altitudes, specially equipped balloons are used to gather this data. And above 29,000 feet, many airline aircraft are equipped with sensors and automatic datalink of temperature, dew point and other data. But between approximately 10,000 to 29,000 feet, weather data is very sparse.

It is not economically feasible to equip smaller general aviation aircraft that normally fly between 10,000 and 29,000 feet altitudes with sensors and data link, and balloons are not feasible at these altitudes. And although the weather forecast models employed by the National Weather Service have greatly improved, they are still impaired by the fact that measurements of temperature and dew point in the middle altitudes are sparse. Forecasts derived from these models would be greatly enhanced if more accurate, real-time temperature and dew point data was available. Nearly all of the weather products produced by the National Weather Service would be enhanced, including many for non-aviation purposes. But most importantly to GAMA, general aviation safety would be improved.

## **AIR TRAFFIC MANAGEMENT**

No where is the need for a coordinated national vision for aerospace more apparent than in the work NASA does in the air traffic control area. The Multi-Center Traffic Management Area is an example where common goals and objectives have resulted in excellent products that can be rapidly implemented by the FAA. But other areas, such as airspace modeling, the lack of coordination and a shared vision is quite apparent. We are especially concerned that the Virtual Airspace Modeling and Simulation Project, known as VAMS, will consume an inordinate amount of NASA's resources, and many of these resources seem to duplicate those within the FAA.

Clearly, NASA has capabilities and facilities that FAA does not have, and it makes no sense to duplicate these capabilities and facilities within our government. In the area of air traffic control, NASA is essentially a longer-term research agency for the FAA. But FAA's horizon is, and should be much shorter-term than NASA's. So it is essential that NASA's role should include "pushing the envelope" in air traffic control technologies, often beyond what can be seen from today's perspectives. This role is often difficult for the FAA.

## **CONCLUSION**

In conclusion, the general aviation industry has benefited enormously from NASA R&D programs. These programs are vital to the continued growth and evolution of general aviation industry and its vision to bring affordable air travel to the most remote communities. However, without a single, clear roadmap for the development of aeronautics that cuts across all parts of our government, resources will be wasted and time lost.

Thank you for the opportunity to testify today. I would be happy to answer any questions you might have.